

4/27/17

"Experience enables you to recognize a mistake when you make it again."-Franklin P. Jones

HW: "The Unit Circle" homework section
Test 1 on Tuesday 5/2

AIM: What is the Unit Circle?

Warm Up:

$$(x-h)^2 + (y-k)^2 = r^2$$

Exercise #1: From our work with equations of circles, which of the following would represent the equation of the unit circle?

(1) $x + y = 1$

(3) $x^2 + y^2 = 1$

(2) $y = x^2 + 1$

(4) $(x-1)^2 + (y-1)^2 = 1$

$$(x-0)^2 + (y-0)^2 = 1^2$$
$$x^2 + y^2 = 1$$

The basis of trigonometry will be a very special circle known as **the unit circle**. This is simply a circle that has its center located at the origin and has a radius equal to one unit (hence the name "unit").

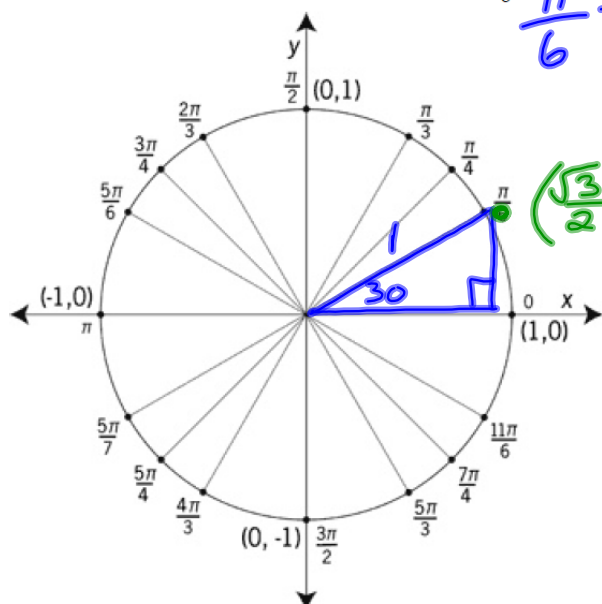
$$r = 1$$



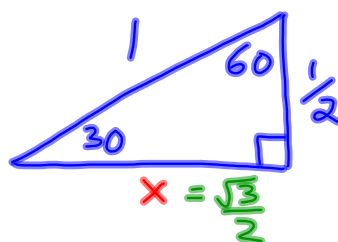
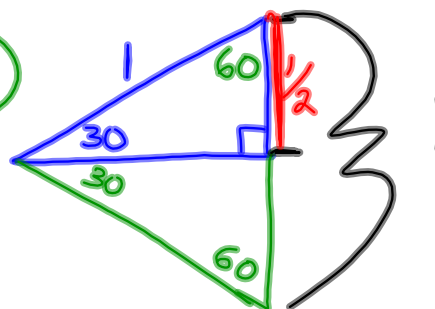
Next we will seek to produce some of the coordinate points that lie on the unit circle through the use of the Pythagorean Theorem. The next two exercises will illustrate the important right triangles we will need.

Exercise #2: Let's investigate an angle of $\frac{\pi}{6}$ drawn in standard position.

$$\frac{\pi}{6} = \frac{180}{6} = 30^\circ$$



$$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$$



$$x^2 = \frac{3}{4}$$

$$x = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}} = \frac{\sqrt{3}}{2}$$

$$x = \frac{\sqrt{3}}{2}$$

$$a^2 + b^2 = c^2$$

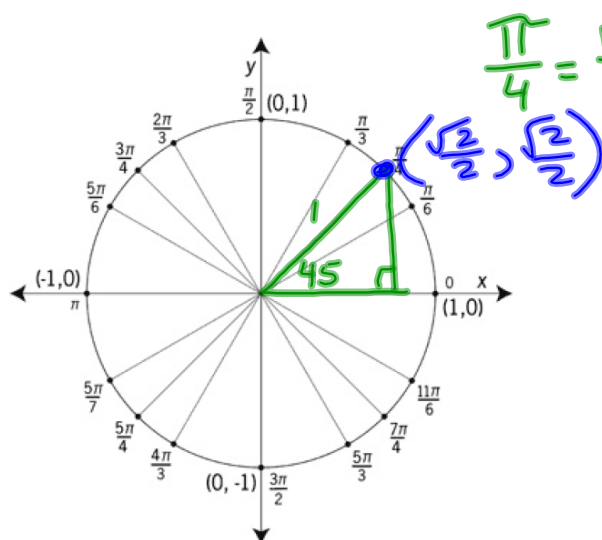
$$x^2 + \left(\frac{1}{2}\right)^2 = 1^2$$

$$x^2 + \frac{1}{4} = 1$$

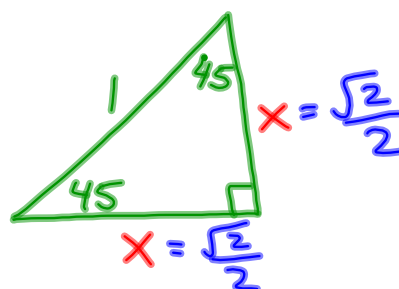
$$-\frac{1}{4} \quad -\frac{1}{4}$$

$$x^2 = \frac{3}{4}$$

Exercise #3: Let's investigate an angle of $\frac{\pi}{4}$ drawn in standard position.



$$\frac{\pi}{4} = \frac{180}{4} = 45^\circ$$



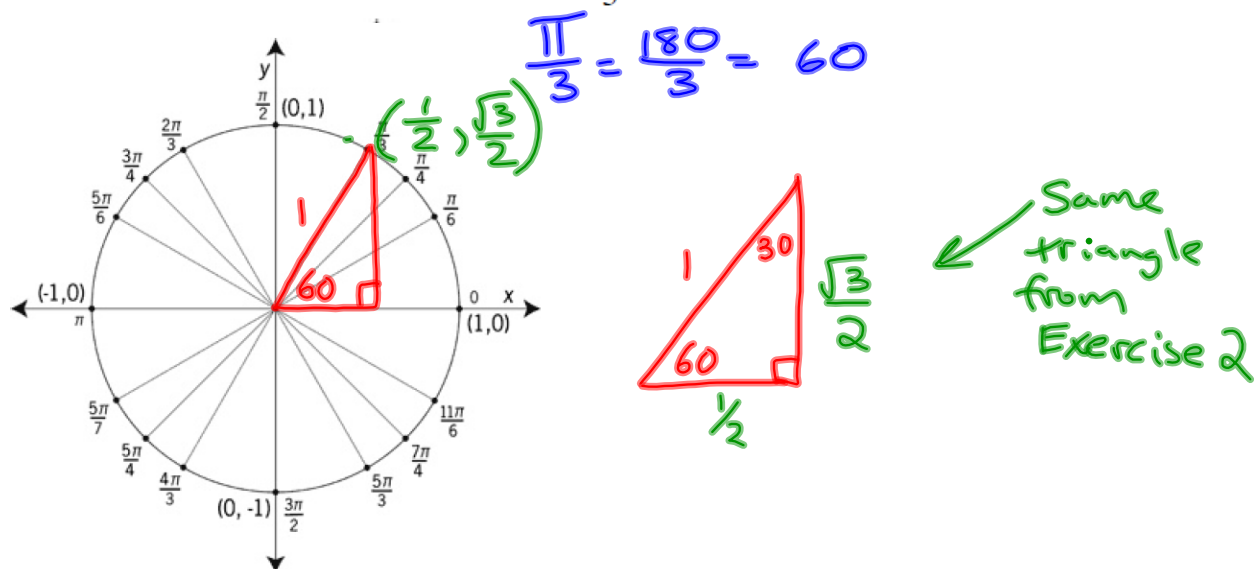
$$x^2 + x^2 = 1^2$$

$$2x^2 = 1$$

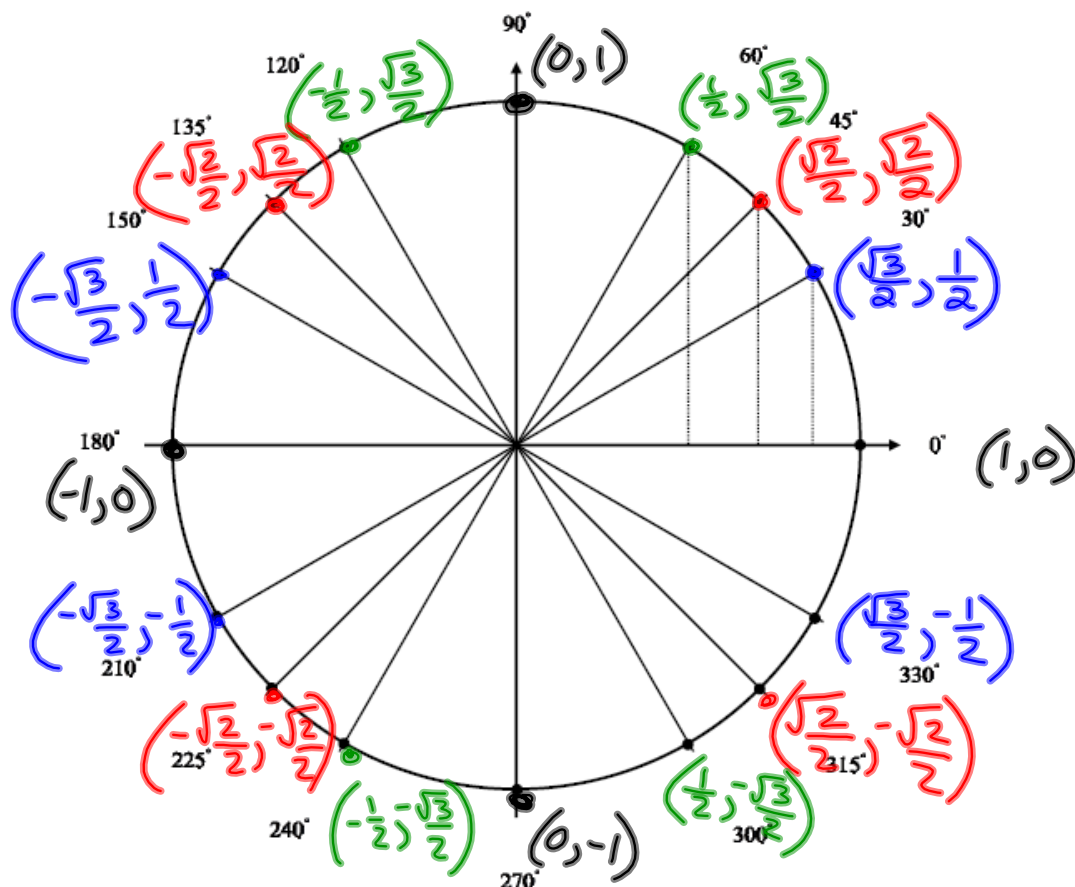
$$x^2 = \frac{1}{2}$$

$$x = \sqrt{\frac{1}{2}} = \frac{\sqrt{1}}{\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

Exercise #4: let's investigate an angle of $\frac{\pi}{3}$ drawn in standard position.



Exercise #5: The diagram below represents the **unit circle**. Based on your work from *Exercises #2 and #3*, fill in the ordered pairs at each of the following angles that are assumed to be drawn in standard position.



Exercise #6: For each of the following angles drawn in standard position, give the coordinate pair from the unit circle.

(a) -120°

$$\frac{+360}{240}$$

$$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$$

(b) 495°

$$\frac{-360}{135}$$

$$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$$

(c) $\frac{\pi}{3} = \frac{180}{3} = 60$

$$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$$

(d) $\frac{3\pi}{2}$

$$\frac{3(180)}{2} = 270$$

$$(0, -1)$$